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LESSON 1

Robotic Simple Prostatectomy: Indications, Techniques and Outcomes

Learning Objective: At the conclusion of this continuing medical education activity, the participant will be able to describe the indications and outcomes of robotic prostatectomy and characterize the predominant techniques for robotic prostatectomy.

This AUA Update aligns with the American Board of Urology Module on Calculus, Laparoscopy-Robotics and Upper Tract Obstruction. Additional information on this topic can be found in the AUA Core Curriculum sections on BPH and Laparoscopy/Robotics.

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KEY WORDS: robotic, simple, prostatectomy, BPH, surgery

INTRODUCTION

Lower urinary tract symptoms (LUTS) due to benign prostatic hyperplasia (BPH) comprise a widespread and commonplace condition among older men and make up a significant portion of urological practice. **Of U.S. men aged 60–69 years, approximately 70% are affected by BPH/LUTS, and the prevalence of the condition increases with age.[1]** This population is also rapidly growing: throughout the 20th century, the growth of the population aged 65 years and older has surpassed that of all other age groups and the total population.[2] **In addition, the severity of BPH/LUTS is also increasing, with recent trends showing an increased prevalence of BPH-related acute urinary retention and renal failure among hospital visits.[3,4]** Commensurate with the increased need for BPH/LUTS treatments, the field of urology has seen an explosion of novel therapies, from new medications to new, less invasive surgical procedures.

Operative indications for BPH/LUTS include failure of or desire to forgo medical therapy, refractory urinary retention, recurrent urinary tract infections, refractory gross hematuria, recurrent bladder stones and renal insufficiency due to bladder outlet obstruction.[5,6] Simple prostatectomy remains an important surgical option for patients with large glands.[5,6] An increasing number of simple prostatectomies are being performed in a less invasive fashion using a robotic approach.[7] In this Update, we review the history of, techniques and outcomes for robotic simple prostatectomy.

HISTORY

Resection of prostate tissue for BPH/LUTS has been described for over 100 years, with the first open suprapubic prostatectomy described at the end of the 19th century. With the advent of laparoscopy in the late 20th century, the open techniques developed during the intervening years were then adapted for minimally invasive surgery. Schuessler et al published the first series of laparoscopic radical prostatectomies in the late 1990s, and their work was improved on and advanced over the next decade by Guillonneau et al.[8,9] In 2002, Mariano et al published a description of the first pure laparoscopic simple prostatectomy.[10] Six years later, in 2008, Sotelo et al described the first robotic simple prostatectomy.[11] Since then, laparoscopic and robotic approaches to simple prostatectomy have become increasingly popular throughout the late 2000s and early 2010s, and have been demonstrated to be safe and effective.[7,12,13] More recently, utilization of the pure laparoscopic approach has waned in favor of the robotic approach.[14]

The adoption of the da Vinci® Surgical System robotic platform and its application to the simple prostatectomy can be potentially explained by several factors, including ease of use, ergonomics and generalizability of the robotic skill set. Moreover, the surgical skills and equipment utilized for other commonly performed robotic procedures, including radical prostatectomy and nephrectomy, are readily transferrable to simple prostatectomy. In contrast, holmium laser enucleation of the prostate (HoLEP), another procedure frequently used for large prostate glands, requires specific equipment and–perhaps more importantly–specialized skills that require intense training to master.[15] One of the major barriers to widespread adoption of HoLEP has been a reported longer learning curve, with approximately 25–50 cases needed for proficiency, compared to 10–12 reported for robotic simple prostatectomy for surgeons experienced with robotic surgery.[15–17]

Notably, exposure to robotic surgery during urology residency training has significantly increased over the past decade. Among urology resident case logs, robotic surgeries accounted for 22% of procedures performed in 2011–2012, but by 2016–2017 had doubled to 45%.[18]

INDICATIONS AND PREOPERATIVE ASSESSMENT

The main determinant of pursuing simple prostatectomy as opposed to other bladder outlet reduction procedures is prostate volume.[5,6] **The American Urological Association (AUA) guideline on the surgical management of BPH recommends that simple prostatectomy be considered in patients with large glands.[5,6] Accordingly, transrectal ultrasound or cross-sectional imaging with computerized tomography (CT) or magnetic resonance imaging should be utilized to determine prostate size and shape to determine the optimal approach to outlet reduction.[5,6]** While the definition of a "large" prostate remains subjective, discussion of simple prostatectomy may be considered in patients with prostate glands ≥85 cc.[5,6] Larger glands increase resection times for transurethral resection of the prostate (TURP) and are associated with increased complications, decreased effectiveness and decreased efficiency: in prostates >80 cc, the percentage of prostate tissue resected decreases to 53.2% with TURP compared to 84.4% with prostatectomy.[19–21] Newer technologies such as water vapor thermal therapy and urethral lift are not recommended for glands >80 cc.[5,6]

As recommended by the AUA guideline, preoperative evaluation should include a history, physical examination, post-void residual (PVR) and prostate volume assessment. Other tests–including uroflowmetry, pressure flow studies, cystoscopy and prostate specific antigen (PSA)–may be considered as clinically indicated.[5,6] The timing and technique of the intervention should be a shared decision between patient and physician prior to surgical intervention.

If the decision is made to offer the patient robotic prostatectomy, patients should be counseled regarding potential risks of abdominal and laparoscopic surgery. Compared to open surgery, robotic simple prostatectomy has equivalent functional outcomes but with less blood loss, shorter catheter time, decreased hospital length of stay, and decreased risks of transfusion and other complications.[22–26] The potential risks

ABBREVIATIONS: American Urological Association (AUA), benign prostatic hyperplasia (BPH), computerized tomography (CT), holmium laser enucleation of the prostate (HoLEP), International Prostate Symptom Score (I-PSS), lower urinary tract symptoms (LUTS), post-void residual (PVR), prostate specific antigen (PSA), transurethral resection of the prostate (TURP)

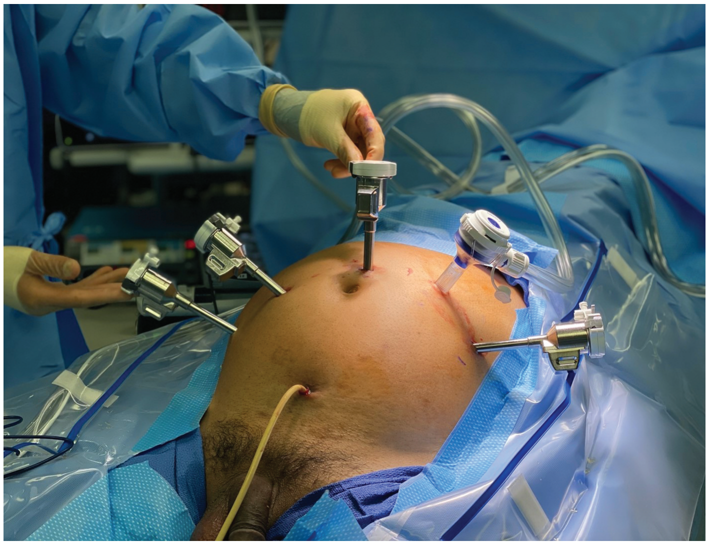
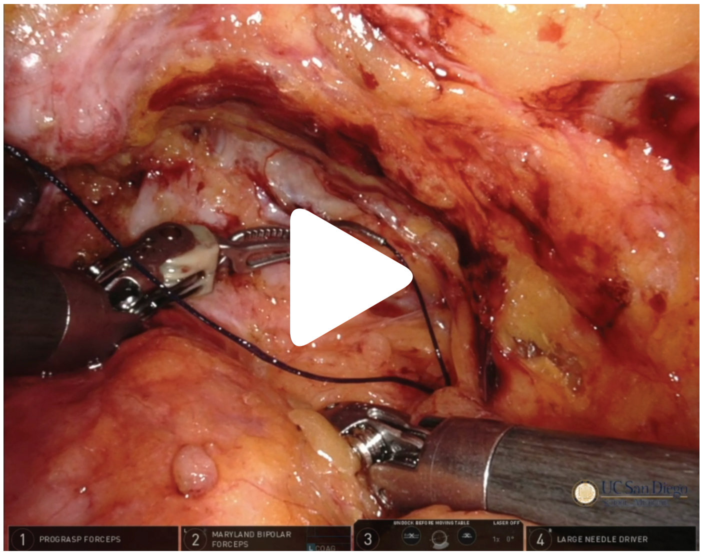


Figure 1. Example of da Vinci robotic port placement. Ports are placed in transverse line at level of umbilicus. This particular patient had suprapubic tube placed due to urinary retention.



Video 1. Demonstration of the transcapsular approach to simple prostatectomy. Video available at https://auau.auanet.org/US2022-L1.

of urinary incontinence (<5%), erectile dysfunction (typically 0- to 3-point change in Sexual Health Inventory for Men and International Index of Erectile Function scores) and ejaculatory dysfunction, such as retrograde or anejaculation (80%–90% in open prostatectomy), should also be discussed.[24] As with most pelvic robotic procedures, some patients with restrictive pulmonary disease may not be able to tolerate the combination of the steep Trendelenburg position and intra-abdominal insufflation. The pneumoperitoneum required for robotic procedures can cause bradycardia, hypotension, hypercarbia and dependent edema. Should there be any concern regarding these events, the first maneuver should be to reduce or stop the insufflation. Other considerations prior to surgery include advanced age, frailty, prior extensive abdominal or pelvic surgery, and anticoagulation status. In patients at increased risk for bleeding, such as those who require ongoing anticoagulation, laser therapies such as HoLEP or photovaporization of the prostate should be considered.[5,6]

OPERATIVE PRINCIPLES AND INITIAL STEPS

Two main approaches exist for exposing and removing the adenoma, and closely mirror the open approaches. In the transcapsular approach, the capsule of the prostate is incised anteriorly to expose the adenoma. In the transvesical approach, the bladder is opened and the adenoma is approached through the bladder.

After draping the patient, a Foley catheter is placed in the surgical field. Robotic ports are placed in a transverse line at the level of the umbilicus (fig. 1). Alternatively, an extraperitoneal approach incorporating infra-umbilical port placement or an approach incorporating the da Vinci SP™ (single port) system has been described.[27–29] The patient is then placed in steep Trendelenburg.

After positioning and port placement, the bladder is dropped from the anterior abdominal wall and the space of Retzius is developed until the anterior surface of the prostate is visible. In an alternate technique, the bladder is opened without releasing it from its anterior attachments.

Retropubic transcapsular approach (Video 1). The overlying adipose tissue is cleared off the prostate and endopelvic fascia to facilitate visualization of the anatomy and dissection. The endopelvic fascia is left intact. The bladder neck is identified. Gentle retraction of the Foley catheter and the resultant movement of the catheter balloon can aid in identification of the bladder neck. A transverse incision is then made in the capsule of the prostate approximately 1 cm distal to the bladder neck (fig. 2) and carried deeper until the adenoma is visible. The incision should be made broadly to allow for adequate exposure and removal of the adenoma. Marking sutures placed at the corners of the incision aid in identification of the lateral aspect of the prostate and assist in closure.

The adenoma is then dissected out using a combination of blunt dissection and judicious cautery with monopolar scissors. The dissection is first carried out laterally in each direction and then distally to expose and free the apexes of each lateral lobe

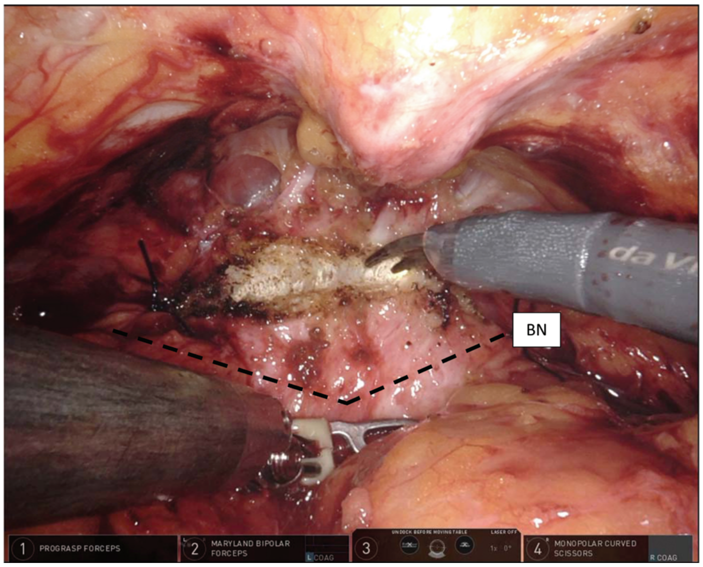

BN
da Vi
1 PROGRASP FORCEPS
2 MARYLAND BIPOLAR FORCEPS
L COAG
UNDOCK BEFORE MOVING TABLE
LASER OFF
3
1x 0°
4 MONOPOLAR CURVED SCISSORS
R COAG

Figure 2. Transcapsular approach: incision is made in capsule approximately 1 cm distal to bladder neck (*BN*), represented by dotted line. Sutures may be placed at apexes of anticipated incision for identification.

of the prostate (fig. 3). The Foley catheter should be confirmed to be in the bladder, and the anterior commissure between the 2 lateral lobes of the prostate is then divided in the midline until the catheter is exposed (fig. 4). Each lateral lobe of the prostate is then removed separately using a combination of blunt and sharp dissection, working from distal to proximal (fig. 5). The adenoma is separated from the posterior urethral plate on each side, leaving the posterior urethra in place (fig. 6). The muscular rhabdosphincter fibers are easily visualized and should be protected to avoid injury. As the dissection approaches the bladder neck, the detrusor fibers can be swept off the adenoma, preserving the bladder neck and potentially the intrinsic urinary sphincter. The median lobe can be approached laterally from either side, taking care to sweep the detrusor fibers of the bladder neck, trigone and urethra away from the adenoma.

After the adenoma has been removed, the prostatic fossa is carefully inspected for bleeding and hemostasis is achieved. Areas of persistent bleeding may be controlled through electrocautery or suture ligature. Bleeding typically occurs in the location of the vascular pedicles from the posterolateral aspect of the prostate base. A Foley catheter is placed, and the prostatic capsule is closed in a running fashion with absorbable suture. Commercial hemostatic agents may be placed into the prostatic fossa before the capsule is completely closed to aid in hemostasis. A Jackson-Pratt drain may be placed in the pelvis at the conclusion of the procedure according to surgeon preference.

Suprapubic transvesical approach (Video 2). The bladder is filled with irrigation and then entered through either a transverse or longitudinal cystotomy at the dome of the bladder depending on preference. The edges of the bladder may be retracted by placing stay sutures into the peritoneum laterally. The cystotomy should be large enough to facilitate easy entry of all robotic and assistant instruments. Any stones within the bladder can be easily removed. Alternatively, the bladder may be dropped from its anterior abdominal attachments and a transverse

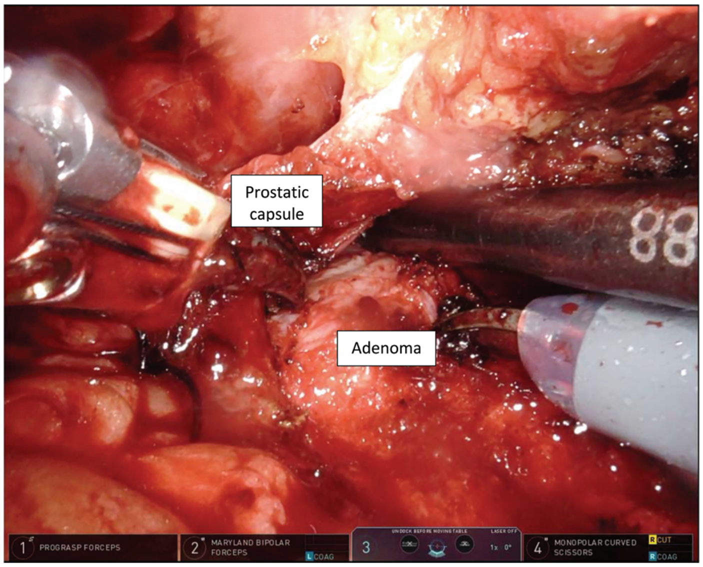

Prostatic capsule
Adenoma
1 PROGRASP FORCEPS
2 MARYLAND BIPOLAR FORCEPS
COAG
3
UNDOCK BEFORE MOVING TABLE
LASER OFF
4 MONOPOLAR CURVED SCISSORS
CUT
COAG

Figure 3. Transcapsular approach: apical corners of prostate are separated from prostatic capsule.

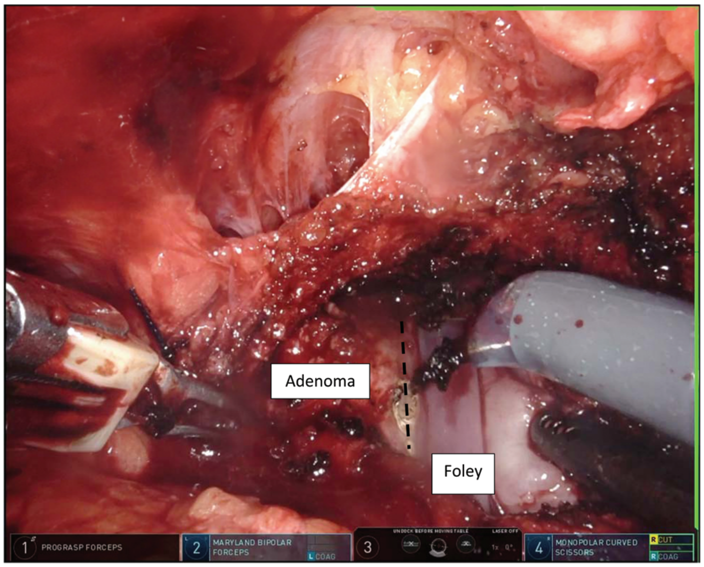
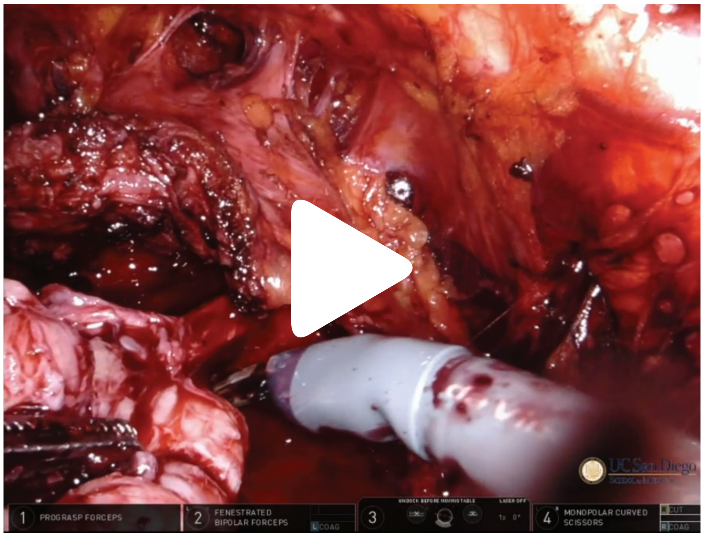

Adenoma
Foley
1 PROGRASP FORCEPS
2 MARYLAND BIPOLAR FORCEPS
COAG
3
UNDOCK BEFORE MOVING TABLE
LASER OFF
4 MONOPOLAR CURVED SCISSORS
CUT
COAG

Figure 4. Transcapsular approach: anterior commissure of prostate is split to expose Foley catheter. Incision in mucosa is made lateral to catheter to approach lateral adenoma and leave posterior strip of mucosa.


UC San Diego
1 PROGRASP FORCEPS
2 FENESTRATED BIPOLAR FORCEPS
COAG
3
UNDOCK BEFORE MOVING TABLE
LASER OFF
4 MONOPOLAR CURVED SCISSORS
CUT
COAG

Video 2. Demonstration of the transvesical approach to simple prostatectomy. Video available at https://auau.auanet.org/US2022-L1.

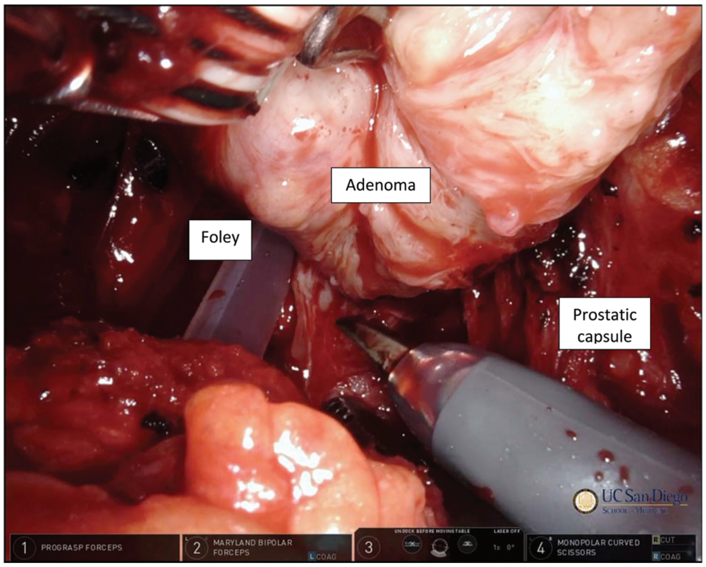

Adenoma
Foley
Prostatic capsule
UC San Diego
1 PROGRASP FORCEPS
2 MARYLAND BIPOLAR FORCEPS
COAG
3
UNDOCK BEFORE MOVING TABLE
LASER OFF
4 MONOPOLAR CURVED SCISSORS
CUT
COAG

Figure 5. Transcapsular approach: lateral lobe of adenoma is separated from posterior mucosal strip.

incision approximately 1 cm proximal to the bladder neck may be performed (fig. 7).

Next, a circumferential incision is made around the bladder neck, taking care to avoid the ureteral orifices (fig. 8). The incision should be wide enough to allow the adenoma to be removed easily but still preserve as much of the trigone and detrusor tissue as possible to allow for later coverage of the prostatic fossa. Beginning at the posterior aspect of the circumferential incision of the bladder neck, the detrusor fibers are then divided until the glistening white tissue of the prostatic adenoma is seen. The incision should then be widened to allow for sufficient exposure. The adenoma is then followed posteriorly, separating the adenoma from the capsule (fig. 9). Much of this step can be done bluntly while judiciously cauterizing any bleeding vessels. Once a satisfactory plane is established posteriorly, it can be extended along the lateral sides of the adenoma (fig. 10). Typically, the posterior and lateral edges of the adenoma are the easiest to identify and separate from the capsule, while the anterior is the most challenging and should be reserved for when an acceptable plane has been established.

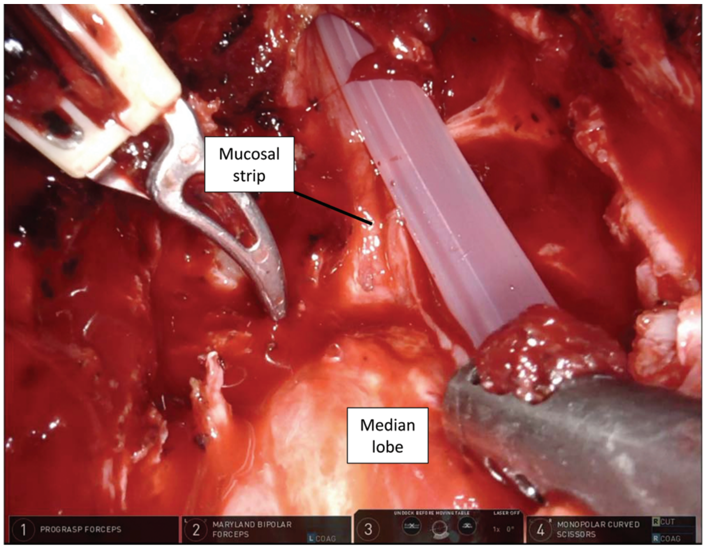

Mucosal strip
Median lobe
1 PROGRASP FORCEPS
2 MARYLAND BIPOLAR FORCEPS
3
4 MONOPOLAR CURVED SCISSORS

Figure 6. Transcapsular approach: catheter is displaced laterally to illustrate intact posterior mucosal strip.

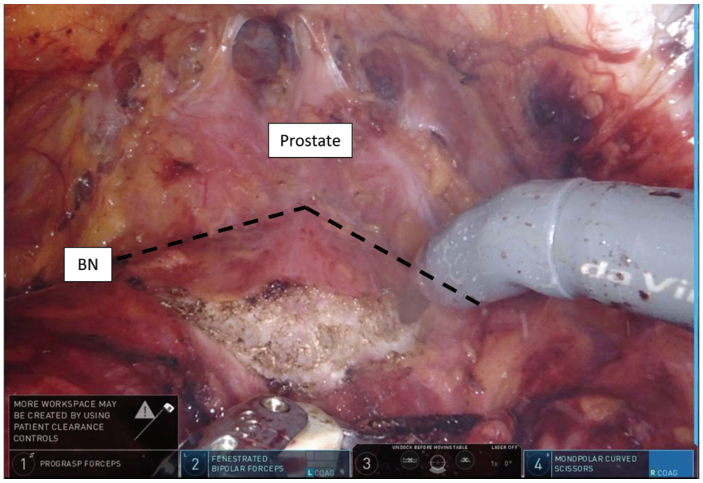

Prostate
BN
MORE WORKSPACE MAY BE CREATED BY USING PATIENT CLEARANCE CONTROLS
1 PROGRASP FORCEPS
2 FENESTRATED BIPOLAR FORCEPS
3
4 MONOPOLAR CURVED SCISSORS

Figure 7. Transvesical approach: incision is made approximately 1 cm proximal to bladder neck (BN) as denoted by dotted line.

The separation of the adenoma from the capsule is then continued until the apex of the adenoma is approached. Retraction of the adenoma can be accomplished either by use

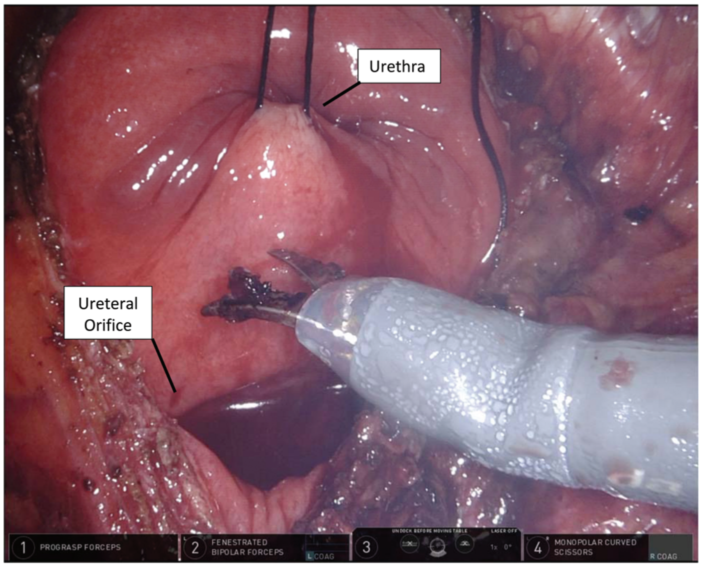

Urethra
Ureteral Orifice
1 PROGRASP FORCEPS
2 FENESTRATED BIPOLAR FORCEPS
3
4 MONOPOLAR CURVED SCISSORS

Figure 8. Transvesical approach: bladder is opened to expose bladder neck. Here a suture is placed into posterior aspect of prostate to provide retraction.

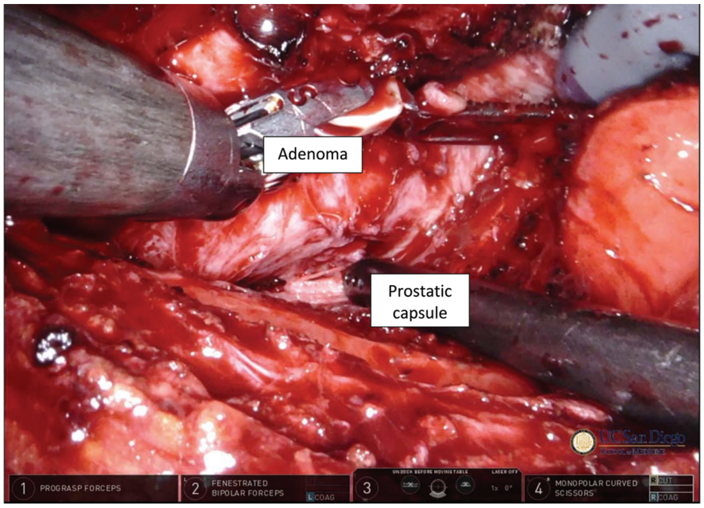

Adenoma
Prostatic capsule
UC San Diego
1 PROGRASP FORCEPS
2 FENESTRATED BIPOLAR FORCEPS
3
4 MONOPOLAR CURVED SCISSORS

Figure 9. Transvesical approach: adenoma is separated from capsule. Posterior aspect is typically easiest place to identify correct plane.

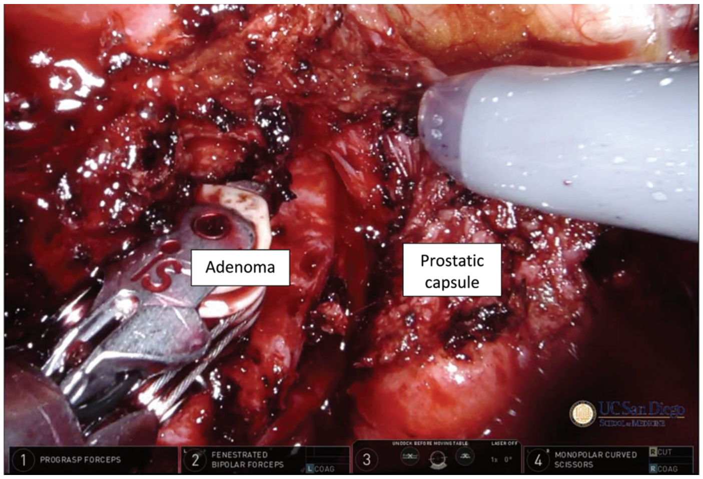

Adenoma
Prostatic capsule
UC San Diego
1 PROGRASP FORCEPS
2 FENESTRATED BIPOLAR FORCEPS
3
4 MONOPOLAR CURVED SCISSORS

Figure 10. Transvesical approach: adenoma is continued to be separated circumferentially from prostatic capsule.

of the robotic tenaculum or by placing a holding stitch into the adenoma. For a holding stitch, we recommend a 0-silk in a figure-8 configuration. Multiple holding stitches may be placed as the dissection progresses.

Once the apex of the adenoma is reached, the catheter position within the urethra should be confirmed. The membranous urethra at the apex of the prostate is then divided sharply (fig. 11). Once the adenoma is freed and removed from the prostatic fossa, bleeding areas should be controlled primarily with monopolar and bipolar cautery, and suture ligature as needed. Bleeding typically occurs in the location of the vascular pedicles at 5 and 7 o'clock and can be oversewn, if needed, for hemostasis. The bladder mucosa and trigone are then advanced into the prostatic fossa (fig. 12). We typically use a single 2-0 polyglycolic acid suture in a U configuration. Some surgeons have described a circumferential mucosal anastomosis to connect the urethral mucosa to the bladder neck.[30] A 3-way Foley catheter is placed under direct visualization. The bladder is then closed and a Jackson-Pratt drain is placed in the pelvis.

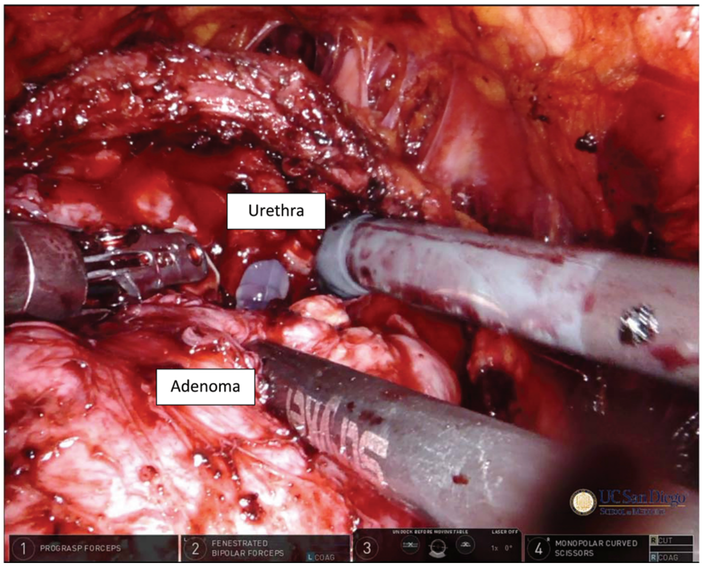


Figure 11. Transvesical approach: urethra is divided at apex of adenoma to reveal Foley catheter.

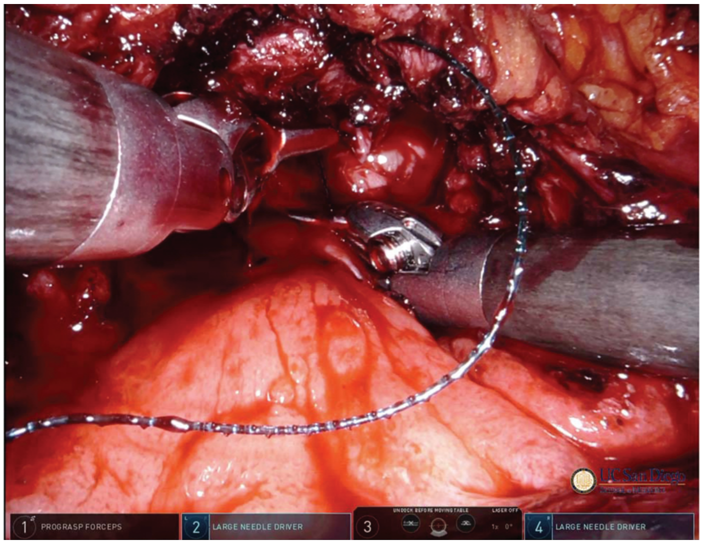


Figure 12. Transvesical approach: posterior lip of bladder neck is advanced into prostatic fossa.

POSTOPERATIVE CARE

Postprocedural care is similar regardless of the approach. Traction is typically not required, and continuous bladder irrigation may be initiated depending on the degree of postprocedural hematuria. Patients are typically observed overnight and discharged on the first postoperative day. Any surgical drains are typically removed prior to discharge. The Foley catheter is removed 1 week after surgery. A cystogram may be performed prior to removal if there is a concern during bladder or capsule closure. After discharge, the patient should be followed with symptom score questionnaires (International Prostate Symptom Score [I-PSS]), uroflowmetry, PVR measurement and assessment of LUTS.

OUTCOMES

Published data on outcomes after robot-assisted simple prostatectomy show similar functional outcomes when compared to open simple prostatectomy.[13] The average improvement in I-PSS was 16.8 points (range 7.9–22.1) with an average improvement in maximum flow of approximately 15.4 ml/second (2.6–37.8).[24] Also noted was significant improvement in PVR, with an average PVR no higher than 58 ml across all studies.[24]

Recent systematic reviews show decreased blood loss, shorter catheter time, shorter hospital length of stay, and lower transfusion and other complications rates when compared to open prostatectomy.[22–24] The most recent systematic review estimated blood loss ranged from 98 to 558 cc and the overall average rate of transfusion in more than 1,400 patients was approximately 3%, with a median rate of 1% compared to an average of 11.3% with open procedures.[19,24] There was a higher reported prevalence of transfusion in 3 early small series, while several higher volume centers reported a 0% transfusion rate.

Average length of stay after robotic prostatectomy was 2.75 days (range 1–8.8), with average catheter duration time of 6 days (1.6–13).[24] The overall complication rate was 16.7% (range 0%–37.5%), which included transient urge incontinence (<5.5%) and bladder neck contracture (<1%) at lower rates compared to the open approach.[13,24] However, these complications are not consistently reported in the literature, and are based on case series and not direct comparisons.

Numerous studies have shown a significantly longer operative time with laparoscopic and robotic prostatectomy compared to open.[22–24] Mean operative time among the data published in the most recent systematic review was 156 minutes (range 90–274) for the robotic approach compared to a range of 58.3–115 minutes for the open approach.[13,24] Recent data from a single center suggest that for glands greater than 150 gm compared those less than 150 gm, there may be increased estimated blood loss, but perioperative metrics such as console time, transfusion rate, complication rate, hospital length of stay and postoperative functional outcomes remain similar.[30]

Robotic simple prostatectomy has also been compared to other less invasive procedures such as TURP and HoLEP. Robotic simple prostatectomy showed a higher percentage of prostatic tissue removed compared to TURP (84.4% vs 53.2%) in glands greater than 80 cc as well significantly better I-PSS, maximum voided flow, quality of life and PVR volume.[20] **Comparing robotic simple prostatectomy with HoLEP, recent studies show comparable improvement in flow, I-PSS and PVR, and similar overall complication rates, but a significantly higher rate of transient incontinence with HoLEP (see table).[31,32]** Post-HoLEP urinary incontinence typically resolves by 1 year after the procedure and may be related to technique and the learning curve required to master it.[31,33]

Prostatic artery embolization has also become a topic of increasing interest as another potential option for the treatment of BPH/LUTS. Recent studies show fewer adverse events compared to both TURP and open prostatectomy, particularly regarding sexual side effects such as retrograde ejaculation and anejaculation.[34,35] However, compared to both TURP and open prostatectomy, embolization is associated with worse functional outcomes including I-PSS score and peak urine flow.[34,35] No studies have been performed comparing embolization directly with robotic simple prostatectomy. Embolization is currently not recommended outside a clinical trial by the AUA.[5,6]

CONCLUSION

Surgical therapy for BPH and LUTS has progressed significantly over the last few decades. A myriad of new technologies allows for less invasive treatment of a ubiquitous disease process, making determination of prostate size prior to intervention of paramount importance. Robotic simple prostatectomy is a viable, safe and highly successful option for patients with larger glands that demonstrates good functional outcomes and a low risk profile.

DID YOU KNOW?

- Robotic simple prostatectomy is safe, efficacious and indicated in patients with large prostate glands.
- Robotic simple prostatectomy has good functional outcomes with few complications.
- The adenoma can be managed by either a transcapsular or a transvesical approach.

Table. Comparison of robotic simple prostatectomy and HoLEP

	HoLEP vs Robotic Simple Prostatectomy
Flow improvement	Comparable
Change in I-PSS	Comparable
Decrease in PVR	Comparable
Rate of incontinence	Higher (transient)
Overall complication rate	Comparable
Equipment	Requires dedicated equipment (laser, morcellator)
Learning curve	Longer (50 vs 20 cases)
Op time	Comparable to shorter
Hospital stay	Shorter (2 vs 4 days)
Catheter duration	Shorter (2 vs 3 days)
Postop hemoglobin	Comparable to higher

REFERENCES

1. Parsons JK: Benign prostatic hyperplasia and male lower urinary tract symptoms: epidemiology and risk factors. Curr Bladder Dysfunct Rep 2010; 5: 212.
2. Roberts AW, Ogunwole SU, Blakeslee L et al: The population 65 years and older in the United States: 2016. American Community Survey Reports 2018. Available at https://www.census.gov/content/dam/Census/library/publications/2018/acs/ACS-38.pdf.
3. Stroup SP, Palazzi-Churas K, Kopp RP et al: Trends in adverse events of benign prostatic hyperplasia (BPH) in the USA, 1998 to 2008. BJU Int 2012; 109: 84.
4. Groves HK, Chang D, Palazzi K et al: The incidence of acute urinary retention secondary to BPH is increasing among California men. Prostate Cancer Prostatic Dis 2013; 16: 260.
5. Parsons JK, Dahm P, Köhler TS et al: Surgical management of lower urinary tract symptoms attributed to benign prostatic hyperplasia: AUA guideline amendment 2020. J Urol 2020; 204: 799.
6. Foster HE, Barry MJ, Dahm P et al: Surgical management of lower urinary tract symptoms attributed to benign prostatic hyperplasia: AUA guideline. J Urol 2018; 200: 612.
7. Pariser JJ, Pearce SM, Patel SG et al: National trends of simple prostatectomy for benign prostatic hyperplasia with an analysis of risk factors for adverse perioperative outcomes. Urology 2015; 86: 721.
8. Ferretti M and Phillips J: Open , laparoscopic and robotic techniques. Can J Urol, suppl., 2015; 22: 60.
9. Banapour P, Patel N, Kane CJ et al: Robotic-assisted simple prostatectomy: a systematic review and report of a single institution case series. Prostate Cancer Prostatic Dis 2014; 17: 1.
10. Mariano MB, Graziottin TM and Tefilli MV: Laparoscopic prostatectomy with vascular control for benign prostatic hyperplasia. J Urol 2002; 167: 2528.
11. Sotelo R, Clavijo R, Carmona O et al: Robotic simple prostatectomy. J Urol 2008; 179: 513.
12. Holden M and Parsons JK: Robotic-assisted simple prostatectomy: an overview. Urol Clin North Am 2016; 43: 385.
13. Patel ND and Parsons JK: Robotic-assisted simple prostatectomy: is there evidence to go beyond the experimental stage? Curr Urol Rep 2014; 15: 443.
14. Autorino R, Zargar H, Mariano MB et al: Perioperative outcomes of robotic and laparoscopic simple prostatectomy: a European-American multi-institutional analysis. Eur Urol 2015; 68: 86.
15. Kampantais S, Dimopoulos P, Tasleem A et al: Assessing the learning curve of holmium laser enucleation of prostate (HoLEP). A systematic review. Urology 2018; 120: 9.
16. Brunckhorst O, Ahmed K, Nehikhare O et al: Evaluation of the learning curve for holmium laser enucleation of the prostate using multiple outcome measures. Urology 2015; 86: 824.
17. Johnson B, Sorokin I, Singla N et al: Determining the learning curve for robot-assisted simple prostatectomy in surgeons familiar with robotic surgery. J Endourol 2018; 32: 865.
18. Merrill SB, Sohl BS, Thompson RH et al: The balance between open and robotic training among graduating urology residents–does surgical technique need monitoring? J Urol 2020; 203: 996.
19. Matei DV, Brescia A, Mazzoleni F et al: Robot-assisted simple prostatectomy (RASP): does it make sense? BJU Int 2012; 110: 972.
20. Ou R, You M, Tang P et al: A randomized trial of transvesical prostatectomy versus transurethral resection of the prostate for prostate greater than 80 mL. Urology 2010; 76: 958.
21. Agarwal M, Palmer JH and Mufti GR: Transurethral resection for a large prostate–is it safe? Br J Urol 1993; 72: 318.
22. Lucca I, Shariat SF, Hofbauer SL et al: Outcomes of minimally invasive simple prostatectomy for benign prostatic hyperplasia: a systematic review and meta-analysis. World J Urol 2015; 33: 563.
23. Li J, Cao D, Peng L et al: Comparison between minimally invasive simple prostatectomy and open simple prostatectomy for large prostates: a systematic review and meta-analysis of comparative trials. J Endourol 2019; 33: 767.
24. Kordan Y, Canda AE, Köseoğlu E et al: Robotic-assisted simple prostatectomy: a systematic review. J Clin Med 2020; 9: 1798.
25. Bhanvadia R, Ashbrook C, Gahan J et al: Perioperative outcomes and cost of robotic versus open simple prostatectomy in the modern robotic era: results from the National Inpatient Sample. BJU Int 2021; 128: 168.
26. Parsons JK, Rangarajan SS, Palazzi K et al: A national, comparative analysis of perioperative outcomes of open and minimally invasive simple prostatectomy. J Endourol 2015; 29: 919.
27. Steinberg RL, Passoni N, Garbens A et al: Initial experience with extraperitoneal robotic-assisted simple prostatectomy using the da Vinci SP surgical system. J Robot Surg 2020; 14: 601.
28. Lai A, Dobbs RW, Talamini S et al: Single port robotic radical prostatectomy: a systematic review. Transl Androl Urol 2020; 9: 898.
29. Kaouk JH, Haber G-P, Autorino R et al: A novel robotic system for single-port urologic surgery: first clinical investigation. Eur Urol 2014; 66: 1033.
30. Aeen A, Ziho L, David S et al: MP25-17 Robotic simple prostatectomy: comparison of outcomes in patients with <150g vs. ≥150g glands. J Urol, suppl., 2020; 203: e397.
31. Umari P, Fossati N, Gandaglia G et al: Robotic assisted simple prostatectomy versus holmium laser enucleation of the prostate for lower urinary tract symptoms in patients with large volume prostate: a comparative analysis from a high volume center. J Urol 2017; 197: 1108.
32. Zhang MW, El Tayeb MM, Borofsky MS et al: Comparison of perioperative outcomes between holmium laser enucleation of the prostate and robot-assisted simple prostatectomy. J Endourol 2017; 31: 847.
33. Lerner LB, Tyson MD and Mendoza PJ: Stress incontinence during the learning curve of holmium laser enucleation of the prostate. J Endourol 2010; 24: 1655.
34. Abt D, Müllhaupt G, Hechelhammer L et al: Prostatic artery embolisation versus transurethral resection of the prostate for benign prostatic hyperplasia: 2-yr outcomes of a randomised, open-label, single-centre trial. Eur Urol 2021; 80: 34.
35. Russo GI, Kurbatov D, Sansalone S et al: Prostatic arterial embolization vs open prostatectomy: a 1-year matched-pair analysis of functional outcomes and morbidities. Urology 2015; 86: 343.

Study Questions Volume 41 Lesson 1

1. The most important factor used to determine the approach for treatment of benign prostatic hyperplasia and lower urinary tract symptoms is

    a. PSA

    b. age

    c. prostate size

    d. comorbidities

2. A 66-year-old man with a history of cardiac stents 6 months ago on clopidogrel and acetylsalicylic acid presents for evaluation of bothersome weak stream, nocturia, straining, incomplete emptying and frequency. His voiding symptoms are not improved on dual medical therapy. An in-office transrectal US demonstrates a 140 gm prostate. The most appropriate surgical treatment is

    a. transurethral resection of the prostate

    b. laser photovaporization of the prostate

    c. open simple prostatectomy

    d. robotic simple prostatectomy

3. A 63-year-old man on warfarin for atrial fibrillation presents for evaluation of urinary retention. His PVR is 300 cc. Urodynamics confirms an obstructive voiding pattern with decreased flow and good detrusor function. PSA is 3.4 ng/ml. Urinalysis shows no leukocytes and 26 red blood cells. The next step is

    a. transrectal ultrasound

    b. CT urogram

    c. start tamsulosin and finasteride

    d. laser photovaporization of the prostate

4. Two hours after an uncomplicated robotic simple prostatectomy, the patient complains of facial and neck edema and swelling. Vital signs are normal. On examination, the patient has diffuse edema of the face and neck and has difficulty opening his eyes. He is breathing and speaking comfortably without distress. The next step is

    a. observation

    b. echocardiogram

    c. administration of hypertonic saline

    d. intramuscular epinephrine injection

5. After the robot is docked during a simple prostatectomy, the patient develops severe bradycardia. The next step is

    a. administer intravenous fluids

    b. administer intravenous fluids and vasopressors

    c. undock the robot and release the pneumoperitoneum

    d. convert to an open procedure